

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
15 January 2004 (15.01.2004)

PCT

(10) International Publication Number
WO 2004/006238 A3

(51) International Patent Classification⁷: **G11B 11/105**

SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG,
US, UZ, VC, VN, YU, ZA, ZM, ZW.

(21) International Application Number:
PCT/IB2003/002866

(22) International Filing Date: 23 June 2003 (23.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02077668.8 5 July 2002 (05.07.2002) EP
02079581.1 1 November 2002 (01.11.2002) EP

(71) Applicant (for all designated States except US): **KONIN-
KLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL];
Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **VAN KESTEREN,
Hans, W.** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA
Eindhoven (NL).

(74) Agent: **DEGUELLE, Wilhelmus, H., G.**; Philips Intel-
lectual Property & Standards, Prof. Holstlaan 6, NL-5656
AA Eindhoven (NL).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC,

(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

— as to applicant's entitlement to apply for and be granted
a patent (Rule 4.17(ii)) for the following designations AE,
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA,
CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES,
FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH,
PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR,
TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO
patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU,
TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT,
RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

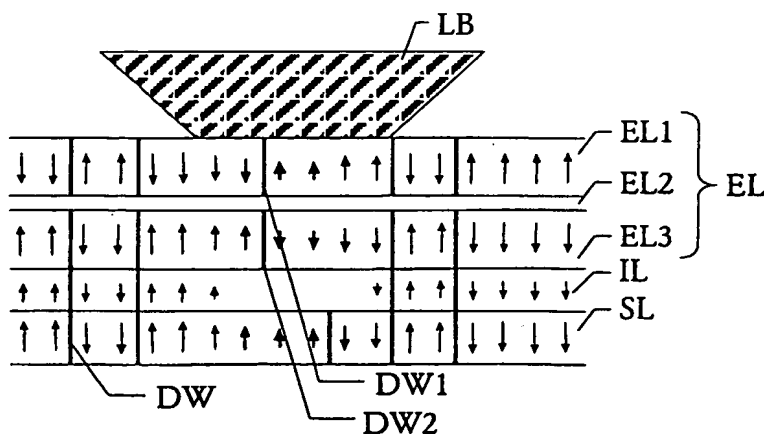
Published:

— with international search report

(88) Date of publication of the international search report:
21 May 2004

For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: **MAGNETO-OPTICAL RECORDING MEDIUM WITH ANTI-FERROMAGNETICALLY COUPLED DOMAIN-EX-
PANSION DOUBLE-LAYER STRUCTURE**



(57) Abstract: A magneto-optical recording medium and manufacturing method for such a medium, wherein a readout expansion layer (EL) consisting of a double- or bi-layer structures with anti-ferromagnetic layers, e.g. GdFeCo or TbFeCo, coupled over a relatively thin non-magnetic metallic layer, e.g. a Ru layer. Under influence of the temperature rise by the focussed spot of a readout radiation beam and the stray field from a storage layer (SL), the magnetization in the double-layer will switch from an anti-parallel to a parallel state. A main advantage of this layer structure is that it offers a symmetric readout response for up and down magnetization in the storage layer (SL) and can in principle be used without external readout field.

INTERNATIONAL SEARCH REPORT

Application No
PCT/IB 03/02866

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G11B11/105

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 756 202 A (VAN KESTEREN HANS W ET AL) 26 May 1998 (1998-05-26) cited in the application the whole document	1
A	US 6 150 038 A (HIROKANE JUNJI ET AL) 21 November 2000 (2000-11-21) the whole document	1

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the International filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the International filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

9 February 2004

Date of mailing of the international search report

16/02/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Nanos, A

INTERNATIONAL SEARCH REPORT

Application No
PCT/IB 03/02866

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>AWANO H ET AL: "MAGNETIC DOMAIN EXPANSION READOUT FOR AMPLIFICATION OF AN ULTRA HIGH DENSITY MAGNETO-OPTICAL RECORDING SIGNAL" APPLIED PHYSICS LETTERS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 69, no. 27, 30 December 1996 (1996-12-30), pages 4257-4259, XP000955335 ISSN: 0003-6951 cited in the application the whole document</p>	1
A	<p>OH S C ET AL: "ENHANCED EXCHANGE COUPLING CONSTANT AND THERMAL STABILITY OF ANTIFERROMAGNETICALLY COUPLED MEDIA WITH THIN CO INTERLAYERS" JOURNAL OF APPLIED PHYSICS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 91, no. 10, PART 3, 15 May 2002 (2002-05-15), pages 8617-8619, XP001115634 ISSN: 0021-8979 the whole document</p>	1
A	<p>WANG J P ET AL: "DESIGN OF LAMINATED ANTIFERROMAGNETICALLY COUPLED MEDIA FOR BEYOND 100 GB/IN² AREAL DENSITY" JOURNAL OF APPLIED PHYSICS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 91, no. 10, 15 May 2002 (2002-05-15), pages 7694-7696, XP001115141 ISSN: 0021-8979 the whole document</p>	1
A	<p>SHAN Z S ET AL: "EFFECTS OF INSERTING THIN CO LAYERS ON THE MAGNETIC AND REVERSAL PROPERTIES OF SYNTHETIC ANTIFERROMAGNETICALLY COUPLED MEDIA" JOURNAL OF APPLIED PHYSICS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 91, no. 10, 15 May 2002 (2002-05-15), pages 7682-7684, XP001115137 ISSN: 0021-8979 the whole document</p>	1

-/--

INTERNATIONAL SEARCH REPORT

Application No
PCT/IB 03/02866

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>CHEKANOV A ET AL: "FLUCTUATION FIELD AND TIME DEPENDENCE OF MAGNETIZATION IN TBFeCO AMORPHOUS RARE EARTH-TRANSITION METAL THIN FILMS FOR PERPENDICULAR MAGNETIC RECORDING"</p> <p>JOURNAL OF APPLIED PHYSICS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 90, no. 9, 1 November 2001 (2001-11-01), pages 4657-4663, XP001124406</p> <p>ISSN: 0021-8979</p> <p>the whole document</p> <p>-----</p>	1

INTERNATIONAL SEARCH REPORT

Application No
PCT/IB 03/02866

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 5756202	A	26-05-1998	DE	69421234 D1	25-11-1999
			DE	69421234 T2	13-04-2000
			EP	0642125 A1	08-03-1995
			JP	7065419 A	10-03-1995
			SG	49286 A1	18-05-1998
<hr/>					
US 6150038	A	21-11-2000	JP	3380483 B2	24-02-2003
			JP	2000163815 A	16-06-2000
			JP	2003132598 A	09-05-2003
			JP	2003132599 A	09-05-2003
<hr/>					